

**M.E DEGREE EXAMINATIONS: JUNE 2013**

Second Semester

**ENERGY ENGINEERING**

EEG 557: Thermal Energy Storage Systems

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**

1. What are the Technical Criteria to be considered for Thermal Energy Storage Systems?
2. What are the important criteria for the selection of thermal energy storage materials?
3. What is the basic concept of steam accumulators?
4. Compare the mass densities of different energy storage materials.
5. What is the basic application of a rotary regenerator?
6. What is transient heat transfer in a heat exchanger?
7. What is the Effectiveness and Efficiency for TES?
8. Which type of phase change is suitable for high temperature TES applications?
9. Name some industries having potential for thermal energy storage.
10. What is the range of temperature of hot fume from the electric furnace?

**PART B (5 x 16 = 80 Marks)**

11. a) (i) Explain the physical principles of thermal energy storage systems. (8)  
(ii) With neat sketches, explain the thermal energy storage with water in thermal stratification. (8)  

**(OR)**
- b) (i) Describe the Methodology for Materials Selection Potential In Thermal Energy Storage. (8)  
(ii) Explain various Sorption Materials for the Application in Solar Heat Energy Storage. (8)
12. a) Discuss in detail about the various solid type sensible heat storage materials like packed bed, Rock bed and pebble bed type.  

**(OR)**
- b) (i) Compare the sensible heat capacity of stone, air and water at different temperature differences of with same volume. (8)  
(ii) With a neat sketch, explain the working of buffer storage system for steam generation. (8)

13. a) With the neat schematic flow diagram explain the heat recovery and storage system with molten salt - off gas heat exchanger for off gas from process industries.

**(OR)**

- b) (i) With neat sketches, explain the different types of Regenerators. (10)  
(ii) What are the different applications of Regenerative type Heat exchangers (6)

14. a) (i) Explain the role PCM in thermal energy storage for different applications. (8)  
(ii) Discuss the various inorganic Phase change materials like salt hydrates . (8)

**(OR)**

- b) Discuss the solidification and melting of a PCM and develop mathematical modeling for find the temperature variation in liquid, sold and transition phases.

15. a) Explain in detail about the principle of Aquifer Thermal Energy Storage for heating and cooling of greenhouse.

**(OR)**

- b) (i) Explain the PCM based thermal energy storage in a solar dryer. (8)  
(ii) With neat schematic diagram, explain the heat recovery energy storage methods adopted in cement industries. (8)

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